

Successful biosolids odor control with peroxide-regenerated iron

Problem: A facility needed to control odors in its solids-handling area as well as sought to reduce costs and improve performance.

Solution: The facility's leadership turned to an integrated iron-regeneration technology program to control sulfides and reduced-sulfur compounds.

For approximately the last 30 years, the Suffolk County Department of Public Works (DPW; Yaphank, N.Y.) Bergen Point Wastewater Treatment Plant (Babylon, N.Y.) has used potassium permanganate to treat hydrogen sulfide and reduce sulfur compound-based odors in its solids-handling processes.

The facility's unstabilized solid-waste stream includes solids from primary clarifiers, thickened waste activated sludge, and chemical solids from a scavenger solids-collection system. The three waste streams are comingled in a 946-m³ (0.25-million gal) sludge blend tank (SBT) that is turned over approximately every 24 hours. Blended solids are pumped from the SBT to belt filter presses where they are dewatered and sent by a screw conveyor to trailers located outside the solids-handling building.

Unstabilized solids have many more odor-causing compounds compared to digested solids, so the facility needed a system capable of treating odors at all stages of the solids-handling operation up to and including off-site disposal. DPW began exploring alternatives that would achieve equal or better performance than its historical potassium permanganate odor-control program. The department also sought a system that would reduce operating costs.

Testing potential solution

In February 2014, DPW initiated a field demonstration to determine if installing peroxide-regenerated iron technology



The Bergen Point Wastewater Treatment Plant (Babylon, N.Y.) has experienced notable cost savings after installing USP Technologies (Atlanta) PRI-TECH® technology, which includes a hydrogen peroxide system (left) and ferrous chloride system (right). USP Technologies

(PRI-TECH®) would offer a more economic approach to controlling odor in the facility's solids-handling processes. PRI-TECH® is a proprietary odor control technology made by USP Technologies (Atlanta) that uses iron salts and oxidants to reduce sulfides to elemental sulfur and reduce other sulfur compounds to nonodorous compounds.

The demonstration test was conducted to ensure the facility could achieve equal or better performance than its old system while reducing operating costs. The technology was tested for its ability to control hydrogen sulfide gas and reduced sulfur compounds, while maintaining the belt filter press operation.

"With a tight budget and our need to maintain an effective and efficient operation at the wastewater treatment plant, it's a must to continually search for cost savings," said Douglas M. Haussel, DPW director of operations and maintenance.

The new process added ferrous chloride as the primary sulfide control agent. The system adds the chemical into the primary solids line upstream of the SBT. Downstream at the SBT recirculation

pumps, the system adds hydrogen peroxide to regenerate iron from ferrous sulfide – this makes free ferrous and/or ferric iron. The discharge piping from the online belt press feed pumps also received hydrogen peroxide to provide additional iron regeneration, odor oxidation, and durational odor control. Iron acts as a catalyst to enable hydrogen peroxide to oxidize reduced sulfur compounds.

Analyzing performance results

A "shake" test measured liquid sulfide and mercaptan levels to assess odor control performance. During this test, portable gaseous hydrogen sulfide instruments or hydrogen sulfide and mercaptan colorimetric tubes measure odor compounds as they are stripped into the vapor phase. In addition, a vapor hydrogen sulfide data logger continuously measured hydrogen sulfide in the SBT headspace. The data logger's cellular transmission capability enabled staff to collect data without disturbing the instrument and establish set-points for alarms. In addition,

staff performed qualitative and quantitative odor monitoring of the dewatered biosolids trailer-staging area.

After optimization during the demonstration and ongoing operation, the shale test revealed little-to-no recorded sulfides or mercaptans in the treated solids. Hydrogen sulfide levels remained statistically similar in the SBT headspace using the PRI-TECH® system or the old potassium permanganate operation. The new system averaged 0.2 ppm hydrogen sulfide with a peak of 9 ppm; the old system averaged 0.2 ppm with a peak of 14 ppm.

Next, the assessment expanded beyond the facility to outside disposal sites. Analytical methods for evaluating specific odor compounds were not available at any of the disposal sites, but according to qualitative feedback from operators, the solids had less odors.

"USP Technologies worked with us very closely and supplied and installed all the necessary equipment to dose their product," Haussel said. "[They] monitored all phases of the system and its effects and produced monthly reports on the operation."

The technology also showed the potential to generate ferric iron coagulant when the proper amount of hydrogen peroxide is added. This could assist in solids dewatering and help produce higher percentage solids in the pressed filter cake. Ferric iron is generated through the reaction of ferrous iron and hydrogen peroxide. During the demonstration and operation during the first year, polymer-use-rates were unaffected, and an increase in percent solids was noted in the filter cake when compared to a similar time period during the previous year.

Cost savings accumulate

"After a 3-month trial period, it was decided to continue with the PRI-TECH odor control program as it showed great promise to realize the expected cost savings while maintaining effective odor control with the solids-disposal process," Haussel said. "I'm glad to report that after a full year of operation, the program has delivered what was promised – a saving to the facility of approximately \$680,000."

Based on the first full year of operation and documented delivery volumes of

ferrous chloride and hydrogen peroxide, the average daily chemical operating cost of the technology suite is \$4460. The previous 3-year average daily potassium-permanganate chemical cost was \$6230. The technology has provided an average chemical savings of \$1770 per day and \$645,828 during the first year of operation. This does not capture additional savings from decreased DPW operator hours from eliminating the handling and managing of potassium permanganate and reducing trucking costs and disposal fees because of slightly thicker solids.

"The demonstrated cost savings and improved operational performance at Suffolk County illustrates how our engineered programs and strong collaboration with customers can provide meaningful and sustainable results," said Thomas Walkosak, general manager of USP Technologies. ■



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